

RTFB Noise Model and Simulator

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May 9, 2012

Noise Model

- Uses 1, 6 or 12 second FPGA bpm data to generate simulated beam motion:
 - Computes corrector drive settings using a user specified machine inverse response matrix
 - Takes computed corrector drives and a forward response matrix to compute beam position at every bpm in the machine for use in the feedback simulation
- Uses existing real-time feedback (RTFB) system software configuration tools
 - Create inverse response matrix to compute corrector drives
 - Can add arbitrary amounts of additional bpm noise
 - Can use a subset of full time-domain bpm data sets for faster processing
 - Can filter out bad bpms based on large offset or data set STD
- FPGA (BSP-100) bpm system upgrade due to be completed this year

File Help

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Mon May 6 13:11:54 CDT 2013 h.2013-0501.00 loaded, condition number is 2.009665401222384e+02

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Corrector/BPM Selection

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Simulator

- Uses output time-domain beam position from the noise model
- Uses existing real-time feedback (RTFB) system software configuration tools
 - Create inverse response matrix to compute corrector drives
 - Can load real machine orbit correction bpm/corrector configurations
 - Provides plotting FFT ratio (with, without feedback), FFT, reverse integrated PSD and PSD
- Uses matlab to apply corrector model + PI regulator (Corrector model derived from frequency domain measurements) to get new corrector drive settings
- Updated bpm positions are derived by multiplying a forward response matrix by the matlab computed corrector drives
- Add additional capabilities:
 - Simulate correctors of various flavors (slow and fast)
 - Simulate various flavors of bpms (Bergoz, monopulse, Libera)
 - Add weighting of various families of correctors/bpms

Simulator GUI

SRFeedbackSimulation

File Help

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Monitors \ Correctors \

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+All -All Count

Corrector/BPM Selection

Calculation Parameters

Lattice: P

Turns:

Smooth points:

Filter frequency (Hz):

Regulator parameter Kp:

Regulator parameter Ki:

run simulation with 100us delay or without? ☒ With ☐ Without

nux36nuy19

12

1

2.5e3

0.41301000

2464.21130000

Number of singular values:

RF frequency (Hz):

Cutoff freq(Hz) for reverse PSD:

Corrector Noise Config:

Feedback simulation config:

run simulation with/without random noise? ☐ With ☒ Without

320

3.519350954000000e+0

0

View P h.2013-0501.00

View G P h.2013-0505.00

Processing/Plotting

Feedback Simulation Config Description:

BPM noise data directory

Load Orbit Correction Config Compute Start Feedback Simulation Postprocess PlotFFTRatio PlotFFT PlotRFFT PlotCorrTime PlotCorrPSD

A1, B1, A3, B4 square matrix with 80 bpms/corrs ns for simulation

/home/oxygen/OAG/oagData/sr/feedbackSimulation/NoiseModelData/2013/02/26/3/fpg